

REMARKS

In view of the preceding amendments and following remarks, reconsideration of the present application is requested. As described below, the Applicant has cancelled claims 9-11, 14, 15, 21-23, 25-41, 43, 44, and 52. Claims 1-8, 12, 13, 16-20, 24, 42, 45-51, and 53-60 remain in the application. The Applicant now address the comments made by the Examiner in the Office Action.

In item 1 of the Office Action the Examiner has pointed out that "Figure 1 should be designated by a legend such as 'Prior Art' because only that which is old is illustrated." The Applicant thanks the Examiner for pointing out this obvious omission on the Applicant's part, and request that the first drawing sheet, which contains Figure 1, be amended as instructed by the Examiner and as appears in the amended drawing sheet attached hereto.

In item 2 of the Office Action the Examiner rejected claim 1 under 35 U.S.C. §112 as being indefinite or failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner further asks "What is meant by 'the package for coupling to **at least two photonic elements**'?" Claim 1 has been amended to read "A photonic component package for coupling at least two photonic elements..." Some further remarks may serve to elucidate what the Applicant is claiming. The photonic component package being claimed can be used to couple multiple photonic elements where a "photonic element" could be, for example and as claimed in claim 17, "... a wave guide, a planar wave guide, a photonic crystal wave guide,

a diffraction wave guide grating, an optical fiber, a collimator, a dual fiber collimator, a multi-fiber collimator, a lens, a diffractive lens, an optical lens, a spherical lens, an aspherical lens, a ball lens, a GRIN lens, a C-lens, a lens system, a mirror, a MEMS-based movable micro-mirror, a flat mirror, a shaped mirror, a diffractive mirror, a grating plate or plates, a laser, a modulator, a photodiode, a VCSEL, or a prism.” In a preferred embodiment of the invention – a VOA package – the photonic component package couples two photonic elements: a MEMS-based movable micro-mirror and a dual fiber collimator. Referring to Fig 2 of the application and using the language of claim 1 (currently amended) the dual fiber collimator serves as the “at least one photonic element” (32) attached to the “photonic inlet” (22) of the “package body” (4). There is a through hole (14) in the package body and in this preferred embodiment the dual fiber collimator would be aligned so as to be essentially orthogonal to the reflective surface of the micro-mirror (12) of the “semiconductor die” (in this case a MEMS die (8)) which is mounted to the package at the other side of the through hole from that having the photonic inlet. Light emitted from one of the optical fibers (say, 34) is focused by the lens (37) through the through hole and the micro-mirror is moved electromechanically so as to reflect the light – or only some portion of it – back through the through hole and into the lens where it is focused onto the end of the non-emitting optical fiber (36). In this manner the light may be “variably optically attenuated”. Thus, in this embodiment the photonic component package – a VOA package – couples a MEMS-based movable micro-mirror with the dual fiber collimator. The Applicant respectfully

requests that the Examiner note that if the MEMS die in the just-described preferred embodiment were a MEMS die of the configuration depicted in Fig 5A, wherein the electrical contact pads (48) are located on the side of the die (11A) opposite the side of the die (11B) containing the die photonic element, in this embodiment a movable micro-mirror (12), then it is *necessary* to have a through hole in the package body in order to mount the MEMS die to the package body in such a way as to couple the photonic element (dual fiber collimator) attached to the photonic inlet with the die photonic element. The reason being that access to the electrical contact pads requires that the opposite side of the die be the one which is mounted to the package. If there were no through hole the movable micro-mirror's reflective surface would then face an inner wall of the package, not the photonic element attached to the photonic inlet.

The Applicant sincerely hopes that the foregoing discussion serves to mitigate any indefiniteness in claim 1 and to particularly point out what the Applicant regards as the invention. The reference to a particular preferred embodiment in the preceding discussion should be viewed as illustrative and neither restrictive nor limiting as to the scope of the present invention.

Further regarding item 1 in the Office Action, the Applicant has, as suggested by the Examiner, removed the phraseology relating to "the package for coupling to at least two photonic elements" in the original form of claim 1 from the pre-amble and placed it in the body of the amended claim 1.

In item 3 of the Office Action the Examiner has further rejected claims 1-4, 7-11, 21-23, 27, 28, 31, 32, and 51 under 35 U.S.C. 102(b) as being fully

anticipated by Bowen et al. (U.S. Patent No. 5,032,898, hereinafter Bowen). Claims 9-11, 21-23, 27, 28, 31, and 32 have been cancelled. Claims 1-4, 7, 8, and 51 remain. Referring to claim 1, the Examiner points out that the invention of Bowen is for mounting to a module and for coupling at least two photonic elements and comprises a package body, at least two pins, and a photonic inlet oriented parallel to a mounting surface of a module and for attaching to at least one photonic element. Based on the Examiner's comments and observations, the Applicant has decided to cancel all claims relating to a photonic component package which does *not* have a through hole. However, in the Office Action the Examiner asserts on Page 5, with specific reference to Claim 9, that "Bowen further disclose in conjunction with Fig 6, a photonic component package wherein the package further comprises a through hole, the through hole coupled with the photonic inlet and the through hole positioned to allow optical coupling of the die photonic element and the at least one photonic element." Applicant respectfully submits that Bowen does not disclose a through hole in the package body as is claimed in the present invention. Examining Fig 6 of Bowen, the Applicant observes that the package body does not have a through hole between the photonic inlet and any die photonic element. Still referring to Fig 6 of Bowen, the Applicant construes the "package body" to be comprised essentially of the "tubular body (42)" (Bowen, column 3, line 50) and the "ferrule member (30)" (Bowen, column 3, line 55). The Applicant respectfully suggests that the only aspect of the figure which may be construed as a through hole is in fact what Applicant refers to as the "photonic inlet" in the present invention; this would

correspond to Bowen's "centering portion (36) of the passageway" (Bowen, column 3, line 38) to which is attached a photonic element, in this instance "waveguide (28)" (Bowen, column 3, line 11).

The Applicant observes that the through hole of the present invention – although specifically referenced throughout the specification, in the drawings, and in independent claims 21, 42, and 51 – was not specifically referenced in the original language of claim 1. The Applicant has addressed this omission by amending claim 1 so as to specifically reference the through hole. Additionally, as mentioned above, all claims relating to a photonic component package *without* a through hole have been cancelled.

The Applicant respectfully submits that as the through hole is referenced frequently throughout the specification, drawings, and claims, the amended form of claim 1 does not in any way add new subject matter.

In Figs 1-6 of Bowen it is clear that the photonic elements (24 and 28) are mounted to one side of the package and that the photonic inlet (44) is located on this same side of the package. However, in the Applicant's invention the through hole permits the photonic element to be mounted to the opposite side of the package from the photonic inlet. This addresses prior art limitations in that many semiconductor die manufactured for use in photonic devices are such that the photonic element side of the die is opposite to the side of the die where the electrical contact pads are located; see, for example, Fig 5A of the Applicant's drawings. Mounting of a semiconductor die which requires electrical connection – for example, a MEMS-based movable micromirror, a photodiode, or a VCSEL –

to a package must be such that there is access to the electrical contact pads which are located on the side of the die opposite to that comprising the die photonic element. Thus, if such a semiconductor die were mounted in a package such as that disclosed by Bowen, it would not be possible to couple the photonic element attached to the photonic inlet with the semiconductor die photonic element since the photonic element side of the die would be facing away from the photonic inlet. The Applicant respectfully submits that the photonic component package of the present invention as recited in the claims clearly defines both the novelty and non-obviousness of the above-referenced application over the teachings of the references cited by the Examiner.

The Applicant concedes that for many photonic components – for example, a wave guide, a planar wave guide, a photonic crystal wave guide, a diffraction wave guide grating, an optical fiber, a collimator, a dual fiber collimator, a multi fiber collimator, a lens, a diffractive lens, and optical lens, a spherical lens, an aspherical lens, a ball lens, a GRIN lens, a C lens, a lens system, a mirror, a flat mirror, a shaped mirror, a diffractive mirror, a grating plate or plates, a laser, a modulator, or a prism – electrical contact pads are either not required or can be located on the same side of the semiconductor die as the photonic element; see, for example, Fig 5B of the Applicant's drawings.

Therefore, claim 4 has been amended to reference only a MEMS-based movable micro-mirror. However, the present invention also applies to the case that the semiconductor die is a photodiode or VCSEL. Therefore these have been incorporated into amended claims 12 and 13, respectively. However, the above-

mentioned photonic components all represent valid potential photonic elements for attaching to the photonic inlet in the case that light is to be received from the semiconductor die element. Therefore, they remain in claim 17 which depends from claim 13 wherein the semiconductor die is a VCSEL since this is the only light emitting die photonic element of the three die photonic element types remaining in the invention according to the amended claims.

In summary, the amended claims are such that the claimed photonic component package body has a through-hole, with the semiconductor die photonic element and the photonic inlet on opposite sides of this through hole, where said through-hole is required in the case that the semiconductor die photonic element is a MEMS-based movable micro-mirror, a photodiode, or a VCSEL when these types of semiconductor die are such that the photonic element side of the die is opposite to the planar side of the die upon which are located the electrical contact pads. Photonic component packages of the prior art, for example that of Bowen, are such that the photonic element attached to the photonic inlet could not be optically coupled with semiconductor die photonic elements of the afore-mentioned types.

Since all rejected claims depend from independent claims which should, in light of the amendments made, be in allowable form, and since these amendments comprise only reiteration involving no new subject matter, the Applicant respectfully requests re-examination and reconsideration of the above referenced patent application in view of the remarks as set forth above and the accompanying changes to the claims. Accordingly, applicant respectfully

contends that the claims remaining in this application are in condition for allowance, and such action is respectfully requested.

If the Examiner is of the opinion that a telephone conference with the Applicant would expedite prosecution, such conference is invited.

Respectfully submitted,

Dated: 9/24/03


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